

United States
Department of
Agriculture

Soil
Conservation
Service

Northeast NTC
160 East 7th Street
Chester, PA 19013

Subject: SOI - Ground-penetrating Radar (GPR) field assistance for
site evaluations in Pennsylvania, March 16 - 18, 1987

To: James H. Olson
State Conservationist
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PURPOSE

To utilize GPR techniques for engineering, geologic, and
soil site investigations.

Participants

Bruce Benton, Geologist, SCS, Harrisburg, PA
Austin Blakeslee, Soil Conservation Tech., SCS, Sciota, PA
James Doolittle, Soil Specialist (GPR), SCS, Chester, PA
Jake Eckenrude, Soil Scientist, SCS, State College, PA
David Faerber, Construction Engineer, SCS, Harrisburg, PA
Walter Hamlyn, Jr., Construction Rep., SCS, Clarks Summit, PA
Linn Hoffmann, Director, PSU Agronomy Farm, Rock Spring, PA
John Metrick, District Conservationist, SCS, Sciota, PA
Donald Murray, Project Engineer, SCS, Bloomsburg, PA
Larry Schardt, District Conservationist, SCS, Bellefonte, PA
Bill Stout, ARS Pasture Research Farm, ARS, Rock Spring, PA
Peter Vanderstrappen, Area Engineer, SCS, State College, PA

Activities

Ground-penetrating radar soil investigations were conducted
at PSU's Rock Spring Research Farm in Rock Spring on March
16th. A geologic site evaluation was completed in an area
of subsidence at the Phillipsburg Country Club in Centre
County on March 17th. That afternoon the GPR unit was
relocated to Clarks Summit. On March 18th, engineering site
evaluations were conducted with the radar on two earthen dam
structures in Pike County. The radar unit returned to the
NENTC during the evening of March 18th.

Results

At PSU's Rock Spring Research Farm highly detailed, small scale soil maps are required by researchers conducting studies on various plots. The small scale of the required soil maps necessitates extremely frequent and time consuming soil borings and highly accurate placement of soil boundary lines. The research farm is underlain by limestone bedrock having a highly irregular surface. Soil Scientists involved in mapping the research farm were concerned with the occurrence and depth distribution of the underlying bedrock. The GPR was used to assist field mapping and to confirm the depth to bedrock in areas of Hagerstown, Hublersburg, and Nolin soils. The GPR provided detailed profiles charting the depth to bedrock and confirming the composition and distribution of soil map units.

The GPR was also used to map the development and expression of traffic and plow pans in an area of Hagerstown soils. Variations in expression of the pan were non-existent to poorly expressed on the graphic profiles. The poor expression of this feature is a result of the high moisture content of the soil and the fact that the study was conducted after the spring thaw had occurred. Dr. Cunningham of PSU requested a return visit by the GPR unit at the time of the Crop Field Day (September 17) to demonstrate the radars potential and to continue this study at a time when the soil moisture content will be lowered and the pan more expressed.

Excessive coal mining beneath the site of the Phillipsburg Country Club has caused the recent collapse of overburden materials along two adjacent fairways. The GPR was used to profile subsurface conditions along eight transects across the collapsed area. While the graphic profiles vividly confirmed the extent and depth of subsidence, no subsurface cavities were discerned on the profiles. It was concluded from the profiles that subsidence is essentially complete in this area.

Ground-penetrating radar techniques were used to conduct two site evaluations of earthen dam structures in Pike County. At the PA 463 site within the Brodhead Watershed, the radar detected several anomalous features above the chimney in the reconstructed portion of the dam. These features appear to be solution cavities and piping features, indicating possible routes of seepage through the embankment. However, minimal settlement and surface erosion was noted along the embankment.

A more comprehensive radar survey and monitoring program was discussed for dam site PA 463. The survey and monitoring program would provide greater probing and cross-sectional profiles of this structure, establish areas of potential

solution problems, and enable a base profile for future comparative studies. If acceptable, I would like to conduct a site evaluation of this dam site with the radar during the week of 27 -31 July 1987.

All graphic profiles have been returned to either Bruce Benton or Jake Eckenrude for review and documentation. I greatly appreciate the opportunity to work in Pennsylvania and with members of your staff.

JAMES A. DOOLITTLE
Soil Specialist (GPR)

cc:
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